LEAN GLOSSARY

3P: Production Preparation Process. Rapidly designing processes and equipment to ensure capability, built-in quality, productivity, and Takt-Flow-Pull. The 3P minimizes resources needed such as capital, tooling, space, inventory, and time.

3Ds: Working conditions or jobs that are dirty, dangerous, or difficult.

3 ELEMENTS OF DEMAND: The three drivers of customer satisfaction are Quality, Cost, and Delivery.

3 GEN PRINCIPLES: The three principles are 1) office floor (gemba), 2) the actual product (gembutsu), and 3) the facts (genjitsu). The key to successful Kaizen is going to the worksite, working with the actual product/process, and getting the facts.

3 ELEMENTS OF JUST IN TIME (JIT): The three elements of JIT are 1) takt time, 2) flow production, and 3) the downstream pull system.

4 Ms: Man/Woman, Machine, Method, and Material.

5 S: The overall idea behind the *Five S*s is that there is "a place for everything and everything goes in its place." *5S* is a systematic process of workplace organization -- the principle of waste elimination through workplace organization. Every item that is used in a business process is clearly labeled and easily accessible. Discipline, simplicity, pride, standardization and repeatability, as emphasized in the *Five S*s, are critical to the Lean enterprise in general and flow implementations specifically. The five terms, all beginning with *S,* are derived from the Japanese words seiri, seiton, seiso, seiketsu, and shitsuke. In English the *5S*s are sort, set in order, shine, standardize, and sustain.

Five S			
AMERICAN		**JAPANESE**	
SORT	Evaluate and eliminate everything not required for the current work, keeping only the bare essentials.	**Seiri** 'Say-ree' (Organization)	Separate needed tools, parts, and instructions from unneeded materials & instantly remove the latter unnecessary things.
SET IN ORDER (Straighten)	Arrange items in a way that they are easily visible and accessible.	**Seiton** 'Say-ton' (Tidiness)	Put things in order: Neatly arrange and identify materials & equipment/tools for ease of use
SHINE (Sweep)	Inspect, refine, and clean everything and find ways to keep it clean. Make this a part of your everyday work.	**Seiso** 'Say-soo' (Purity)	Conduct a cleanup campaign. Clean to original condition. Do cleaning work positively.
STANDARDIZE (Systematize)	Create rules and procedures by which the first 3 S's are maintained. Document.	**Seiketsu** 'Say-kit-sue' (Cleanliness)	Conduct the other 3Ss at frequent, in fact daily, intervals to maintain a work environment in perfect condition. Free from bad habits.
SUSTAIN (Self-discipline)	Keep the other 4S activities from unraveling.	**Shitsuke** 'Shit-zuk-ay' (Discipline)	Be disciplined. Form the habit of always following the first four Ss. Maintain what has been achieved. Be well-mannered; use polite behavior.

5 WHYs: A very simple but effective method of analyzing and solving problems by asking 'why?' five times (or as many times as needed) to get to the root cause of the problem. There can be more than one root cause, and in an organizational setting, usually a team would carry out a root cause analysis for a problem. There is no special technique required for this.

7 NEW TOOLS: Problem-solving tools used for Kaizen and Hoshin Kanri activities. They are 1) matrix diagram, 2) relationship diagrams, 3) process decision program charts, 4) activity network diagrams, 5) radar charts, 6) tree diagrams and 7) affinity diagrams.

7 TOOLS OF QC: Data gathering and analysis tools used for kaizen activities originally by QC Circles. They are 1) check sheets, 2) cause and effect diagrams, 3) Pareto diagrams, 4) histograms, 5) graphs, 6) scatter diagrams, and 7) broken line graphs.

7 WASTES: Taiichi Ohno's original enumeration of the wastes commonly found in physical production. These are *overproduction* ahead of demand, *waiting* for the next processing top, unnecessary *transport* of materials (for example, between functional areas of facilities), *over-processing* of parts due to poor tool and product design, *inventories* more than the absolute minimum, unnecessary *movement* by employees during the course of their work (looking for parts, tools, prints, help, etc.), and production of *defective parts*.

8 WASTES: There are 8 types of waste that describe all wasteful activity in a work environment. Elimination of the 8 wastes leads to improved results/outcomes. The 8 wastes are 1) Overproduction, 2) Transportation, 3) Excess Motion, 4) Waiting, 5) Over-processing, 6) Inventory, 7) Errors/Defects, and 8) Underutilized People.

A3 REPORT: This "A3" sized (11 inches x 17 inches) form is used at Toyota as a one-sheet problem evaluation, root cause analysis, and corrective action planning tool. It often includes sketches, graphics, flow maps or other visual means of summarizing the process current condition and future state. It is evidence of A3 thinking.

A3 THINKING: A3 Thinking is not the same as the A3 Report. The A3 report is the evidence of A3 logical thinking based on the scientific method of problem-solving, on the Plan-Do-Check-Act cycle. Its power derives from the development and sustainment of a dynamic PDCA cultural mindset and thought and dialogue process. The power of the A3 report is its reflection of the process leading to its development and management.

A3 Thinking facilitates objective, logical, and systematic thinking; integrates and visualizes (visual communication) a concise, understandable learning framework; and requires alignment, buy-in, and systems thinking through dialogue. It is at its most powerful when it becomes part of the management philosophy.

ABNORMALITY MANAGEMENT: Being able to see and quickly take action to correct abnormalities (any straying from Standard Work). This is the goal of standardization and visual management. Continuous waste elimination and problem solving through kaizen are only possible when the abnormalities are visible.

ACTIVITY-BASED COSTING (ABC): A management accounting system that assigns cost to products based on the resources used to perform a process (design, order entry, production, etc.) These resources include floor space, raw materials, energy, machine time, labor, etc.

ANDON: A type of visual control that displays the current state of work (i.e., abnormal conditions, work instructions, and job progress information). It is one of the main tools of Jidoka.

A tool of visual management, originating from the Japanese word for 'lamp'. It is a line/process stop. In the manufacturing world, sometimes a cord that a worker can pull to stop the assembly line when he or she detects a defect. Most commonly, andons are lights placed on machines or on production lines to indicate operation status. Andons are often color-coded green (normal operations), yellow (changeover or planned maintenance), and red (abnormal, machine down). Often combined with an audible signal such as music or alarms.

***ANDON* BOARD:** A visual control device in a work area (in a manufacturing environment, typically a lighted overhead display), providing the current status of the process system and alerting team members to emerging problems.

AUTONOMATION: Stopping a line automatically when a defective part is detected. Machines are given 'human intelligence' and are able to detect and prevent defects. Machines stop autonomously when defects are made, asking for help. Autonomation was pioneered by Sakichi Toyoda with the invention of automatic looms that stopped when a thread broke, allowing an operator to manage many looms without risk of producing large amounts of defective cloth. Autonomation is a pillar of the Toyota Production System. [See also *Jidoka*]

AUTOMATIC TIME: The time when a machine/equipment is running on auto cycle and a person does not needed to be there to operate the machine. Commonly used for NC machine cycles, oven cycles, wash cycles, copiers, etc.

BACK FLUSHING: A method of recording accounting transactions for labor and materials based on what was shipped rather than by using material issues or cards. The aim of back flushing is to reduce the number of non value-added transactions.

BALANCED PLANT: An office/program where the capacity of all resources are balanced exactly with customer demand.

BALANCED SCORECARD: The Balanced Scorecard is a strategic management system used to drive performance and accountability throughout the organization. The scorecard balances traditional performance and/or financial measures with more forward-looking indicators in four key dimensions: Financial, Integration/Operational Excellence, Employees, and Customers. It is an organizational framework for implementing and managing strategy at all levels of an enterprise by linking objectives, initiatives, and measures to an organization's strategy. The scorecard provides an enterprise view of an organization's overall performance. It integrates financial measures with other key performance indicators around customer perspectives, internal business processes, and organizational growth, learning, and innovation.

The *balanced scorecard* was created by Dr. Robert Kaplan & Dr. David Norton in the early 1990s.

BATCH: Making or doing activities in groups, lots, or batches in which each part or finished good in the batch is identical. Can happen in both office/admin. and manufacturing environments. Creates 'waste'.

BATCH-AND-QUEUE: Producing more than one piece of an item and then moving those items forward to the next operation before they are all actually needed there. Thus items need to wait in a queue. Also called "Batch-and-Push." Contrasted with continuous flow/Pull.

BENCHMARKING: The process of measuring products, services, and practices against those of leading organizations/entities. It focuses on best practices and methods of world class leaders and compares key performance practices and metrics with other organizations in similar or relevant work, establishing standards for improvement based on what others have been able to achieve. It is an improvement process in which a company or organization compares its performance against best-in-class companies or organizations, determines how those companies or organizations achieved their performance levels, and uses the information to improve its own performance. The subjects that can be benchmarked include strategies, products/programs/services, operations, processes, and procedures.

BEST-IN-CLASS: A best-known example of performance in a particular field/area/ operation. One needs to define both the class and the operation to avoid using the term loosely.

BREAKTHROUGH OBJECTIVES: Objectives that are 'stretch goals' for the organization. Breakthroughs represent a significant change for the organization providing a significant competitive advantage. Breakthrough goals are achieved through multi-functional teamwork.

BROWNFIELD: An existing and operating production facility that is set up for mass-production manufacturing and management methods.

BOTTLENECK: A process in any part of the enterprise (office, production, sales, etc.) that limits the throughput of the whole process. Any resource whose capacity is equal to, or less than the demand placed on it.

BUILD-TO-ORDER: Designing, building, and delivering a service/product based on a customer-specific request. Pull is an important concept of Build-To-Order. Contrast to repetitive manufacturing.

CAPACITY CONSTRAINT RESOURCES (CCR): Where a series of non-bottlenecks, based on the sequence in which they perform their jobs can act as a *CONSTRAINT*.

CATCHBALL: A process used in Hoshin Planning to communicate vertically to obtain consensus on the Means that will be used to attain each Breakthrough Objective. It is a series of discussions between managers and their employees during which data, ideas, and analysis are thrown like a ball-back, forth, up, down, horizontally across the organization. This opens a productive dialogue throughout the entire organization.

CAUSE AND EFFECT DIAGRAM: A problem solving tool used to identify relationships between effects and multiple causes (also Fishbone Diagram, Ishikawa Diagram).

CELL: An arrangement/layout of people, machines, materials and methods in which processing steps are adjacent and in sequential order so that work can be processed one at a time (or in some cases in a constant small batch that is maintained through the process sequence). The purpose of a cell is to achieve and maintain efficient continuous flow. Contrast with Functional Layout.

CELLULAR MANUFACTURING: An alignment of processes and equipment in correct process sequence, where operators work within the cell and materials are presented to them from the outside of the cell. Often, cellular manufacturing has not taken into account waste elimination or Standard Work principles, and therefore greater savings have not been realized.

CHAKU-CHAKU LINE: A method of conducting single-piece flow, where the operator proceeds form machine to machine, taking the part from one machine and loading it into the next. A production line where the only human activity is to 'chaku' or 'load' the machines. The machines eject the finished parts automatically using hanedashi, so that the operators do not have to wait. [See *LOAD-LOAD*]

CHANGE AGENT: Someone who will lead the organization and its staff from the traditional mentality to becoming a Lean Organization -- who leads the cultural change in an organization. Someone whose objective is to help cause the transformation from Current State (traditional processing, e.g. push, batch and queue) to Future State (Lean Enterprise). The catalytic force moving organizations and value streams out of the world of inward-looking batch-and-queue.

CHANGE MANAGEMENT: The process of planning, preparing, educating, resource allocating, and implementing of a cultural change in an organization.

CHANGEOVER: The time from when the last good piece comes off of a machine or process until the first good piece of the next product is made. Changeover time includes set up, warm up, trial run, adjustment, first piece inspection, etc. This includes *preparation* (getting ready to make the change), *replacement* (removing and replacing files, program, etc.), *positioning* (locate the materials in the correct location for use for the task/step), and *adjustment* (first-item inspection, materials/equipment tweaking, trial runs).

CONCURRENT ENGINEERING: Designing a product (or service), its production process, the supporting information flow, and its delivery mechanism at the same time. The benefits include shorter development time from concept to market, a higher product quality, lower overall development cost and lower product or service unit cost. Concurrent engineering requires up-front planning and dedicated resources early in the early stages of development.

CONSTRAINT: Anything that limits a system from achieving higher performance or *THROUGHPUT*. Alternate: That *BOTTLENECK* which most severely limit the organization's ability to achieve higher performance relative to its purpose/goal.

CONTINUOUS FLOW: Each step/process (in the office or plant setting) makes or completes only the one piece that the next step/process needs, and the batch size is one - single-piece flow or one-piece flow. This is the opposite of batch-and-queue.

CONTINUOUS IMPROVEMENT: The never-ending pursuit of waste elimination by continually creating a better workplace, better products, and greater value to society. The process is never perfect -- as the name implies, with continuous improvement you are never done; even the improvement can be improved.

It is to institutionalize the practice of making many small improvements every day and improve overall efficiency. Continuous Improvement refers to the idea that a large number of small improvements in processes are easier to implement than major improvements and have a large cumulative effect.

CONTROL CHART: A statistical problem solving tool that indicates control of a process within established limits.

CONTROL ELEMENT: Any specific process variable that must be controlled. The measurement of a control element indicates whether the process is operating under stable conditions.

COST OF POOR QUALITY: Costs associated with supplying a poor quality product. Categories of cost include internal and external failure costs.

COST OF QUALITY: Costs associated with supplying a quality product. Categories of cost include prevention, appraisal, and failure.

COUNTERCLOCKWISE FLOW: A basic principle of Lean manufacturing cell layout is that the flow of material and the motion of people should be from right to left, or counterclockwise. The origin of this idea came from the design of lathes and machine tools with the chucks on the left side, making it easier for right-handed people to load from right to left.

COUNTER MEASURES: Actions taken to bring less than expected results of a process back up to targeted levels.

COVARIANCE: The impact of one variable upon others in the same group.

CUSTOMER: Customers are the requestors/receivers/"payers" of the service/output of the process. Customers can include clients, their families and friends, referral sources, providers, payers, community, and other staff. Customers can be internal (staff, programs) to the organization or external (clients, their families, contractors, etc.) and both are key to the success of organizational change/improvement. Generally, organizational staff are viewed as providers/suppliers and clients as customers but both can be either at different steps in a process.

CYCLE TIME: Cycle time is the time it takes to do one complete repetition of any particular task/step. Cycle time can be categorized into 1) manual cycle time, 2) machine cycle time, and 3) auto cycle time. Also referred to as *touch time* or *hands-on time*. If cycle time for every step/operation in a complete process can be reduced to equal *Takt* Time, the service/product can be made in Single-Piece Flow.

DAILY MANAGEMENT: The day-to-day activities that are required to serve the customers and ensure that the business is generating profit.

DASHBOARD: A visual tool used for collecting and reporting information about vital customer requirements and/or your business' performance for key customers. Dashboards provide a quick summary of process and/or product performance.

DAYS SUPPLY OF INVENTORY (DSI): Total number of days (if the production level equals zero) that it would take to deplete finished goods inventory for the specified product line.

DEPENDENT EVENTS: Events that occur only after a previous event.

DESIGNED FOR MANUFACTURING AND ASSEMBLY (DFMA): A way of improving cost, quality, and safety of the manufacturing and assembly processes by design.

DESIGN OF EXPERIMENT (DOE): Planning and conducting experiments and evaluating the results. The outcome of a design of experiment includes a mathematical equation predicting the interaction of the factors influencing a process and the relevant output characteristics of the process.

DOWNSTREAM PULL SYSTEM: See *PULL SYSTEM*.

EIGHT WASTES: [See *8 WASTES*]

ELEMENTS OF WORK: The elements of work are 1) value-added work, 2) non value-added work, and 3) waste. Thoroughly understanding the elements of work is a key first step to Lean thinking.

ERROR-PROOFING: Also called Mistake-Proofing. A system that addresses both the work/product and the processes to detect errors before they become defects. [See *Poka-Yoke*]

EXTERNAL SET-UP: All set-up tasks that can be done while equipment is still running. Examples are collecting tools, the next piece of material, preparing or fixtures. Moving set-up activities from internal to external in order to reduce down time is a central activity of set-up reduction and SMED.

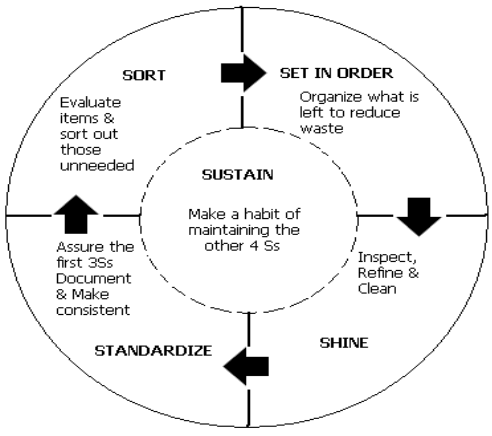
EVAPORATING CLOUDS: A problem methodology used in THEORY OF CONSTRAINTS. Conflict Resolution.

EVERY PART EVERY (EPE): Measured in terms of time (hours, days, weeks, months, etc.) "Every Part Every X" indicates the level of flexibility to produce whatever the customer needs. For instance, Every Part Every day would indicate that changeovers for all products required can be performed each day and the products can be supplied to the customer.

FAILURE MODES AND EFFECTS ANALYSIS (FMEA): A structured approach to determining the seriousness of potential failures and for identifying the sources of each potential failure. The aim is to identify possible failures and implement corrective actions to prevent failures.

FIRST IN FIRST OUT (FIFO): A system of keeping track of the order in which information or materials need to be processed. The goal of FIFO is to prevent earlier orders from being delayed unfairly in favor of new orders.

FIVE S: See *5 S*.



FIVE WHY: See *5 WHY*.

FLOW: In its purest form continuous flow means that items are processed and moved directly to the next process one piece at a time. Each processing step completes its work just before the next process needs the item, and the transfer batch is one. Also known as "one-piece flow" and "make one, move one".

FLOW CHART: A problem-solving tool that maps out the steps in a process visually. The flow (or lack thereof) becomes evident and the wastes and redundancies are identified.

FLOW KAIZEN: Radical Improvement, usually applied only once within a *value stream*. [Same as *KAIKAKU*]

FLOW PRODUCTION: A way of doing things in small quantities in sequential steps, rather than in large batches, lots or mass processing. Product (or service) moves (flows) from process to process in the smallest, quickest possible increment (one piece). Only acceptable quality products or services are accepted by the downstream customer. See also *ONE-PIECE FLOW*.

FUNCTIONAL LAYOUT: The practice of grouping activities/functions or machines by type of operation performed. For example, service request-entry and copiers & shredders. Contrast with *Cell*s.

GEMBA: Is a Japanese word meaning "actual place" or the place where you work to create value. Within each organization, the *Gemba* can be a different place.

GEMBA PRODUCTION SYSTEM: A manufacturing operations transformation strategy based on the Toyota Production System.

GEMBUTSU: Japanese for 'actual thing' or 'actual product'. The tools, materials, machines, parts, and fixtures that are the focus of kaizen activity.

GENCHI GENBUTSU: Go see; go to the real place and see what is actually happening. Go see the problem. This is the belief that practical experience is valued over only theoretical knowledge. You must see the problem to know the problem. (On Site, With the Actual Things)

GENJITSU: Japanese for 'the facts' or 'the reality'. The actual facts or the reality of what is happening on the shop floor and in the business.

GREENFIELD: A new facility in which Lean principles are designed into processing/manufacturing and management systems from the beginning.

HANEDASHI: Auto-eject devices that unload the part from the machine once the cycle is complete. This allows the operators to go from one machine to the next without waiting, picking up and loading parts. Hanedashi is a key component of chaku-chaku lines.

HEIJUNKA: Keeping total production volume as constant as possible. The overall leveling, in the production schedule, of the volume and variety of items produced in given time periods. Heijunka is a pre-requisite for Just-In-Time delivery. [See *LEVELING & PRODUCTION SMOOTHING]*

HISTOGRAM: A problem-solving tool that displays data graphically in distribution. It is often used to reveal the variations that any processes contain.

HORIZONTAL HANDLING: When tasks are assigned to a person in such a way that the focus is on maximizing a certain skill set or use of certain types equipment, this is called horizontal handling. Horizontal handling does not benefit flow. [Contrast to *VERTICAL HANDLING]*

HOSHIN: Goals (with targets) and the means for achieving them in order to address business priorities to move the organization to a new level of performance; variable from year-to-year; could also be multi-year; and is developed by executive management.

HOSHIN KANRI: A method of policy deployment and strategic decision-making that focuses and aligns the organization on a few vital "breakthrough" improvements. The objectives and means to achieve the objectives are cascaded down through the entire organization using a series of linked matrices. The process is self-correcting and encourages organizational learning and continuous improvement of the planning process itself. It is the selection of goals, projects to achieve the goals, designation of people and resources for project completion, and establishment of project metrics: the ship in a storm going in the right direction; shining needle; strategic policy deployment; a powerful strategic planning system. Developed in Japan in the 1960's. [Also known as *Policy Management or Policy Deployment, Hoshin Planning*]

In Hoshin Kanri, organizational leadership identifies critical (3-5) breakthrough objectives/goals and subordinates all other goals or projects to achieving those objectives. Then a process called *catch ball* is used to assure that these objectives are SMART (Simple, Measurable, Attainable, Realistic, Time-based) and, most important, that resources are available. This *catch ball* goes on back and forth between different levels of the organization until there is alignment and agreement that the breakthrough goals are not out of sight.

HOSHIN PLANNING: Also known as Management by Policy or, alternatively, Strategy Deployment. A means by which goals are established and measures are created to ensure progress toward those goals. HP keeps activities at all levels of a company aligned with its overarching strategic plans. Hoshin Planning typically begins with the "visioning process," which addresses the key questions: Where do you want to be in the future? How do you want to get there? When do you want to achieve your goal? And Who will be involved in achieving the goals? HP then systematically explodes the whats, whens, whos and hows throughout the entire organization

IJO-KANRI: [See *Abnormality Management]*

INFORMATION MANAGEMENT TASK: The task of taking a specific product from order-taking through detailed scheduling to delivery. [See *Value Stream*]

INFORMATIVE INSPECTION: A form of inspection used to determine non-conforming product. [See *Inspection* or *Judgment Inspection*]

INSPECTION: Comparing product, or component against specifications to determine if such product or component meets requirements. [See *Judgment Inspection* or *Informative Inspection*]

INTELLIGENT AUTOMATION: [See *Autonomation]*

INTERNAL SET-UP: Set-up tasks that can only be done when the machine is stopped. Examples are changing the fixture, changing the tools, or making adjustments. After as many of

the internal tasks have been externalized as is possible, the remaining internal changeover time is reduced through use of quick-change mechanisms.

INVENTORY: A major cost for most organizations/businesses; inventory is all raw materials, purchased parts, work-in-process components, and finished products that are not yet provided/sold to a customer. Inventory may also include "consumable" goods used in the process/production itself.

JIDOKA: Stopping a process automatically when a defective product is detected. Automatically stopping abnormalities and immediately notifying the worker. The idea is to build in quality by preventing any error from going to the next step/process. Exceptions are handled in real time. Examples include the *andon* and *pokayoke* -- also known as "autonomation with a human touch." It is one of the two main pillars of TPS. [See *Autonomation]*

JISHUKEN: Management driven kaizen activity where management members identify areas in need of continuous improvement and spread information through the organization to stimulate kaizen activity. Fresh eyes; an important concept in Observation-Based Safety.

JUDGMENT INSPECTION: A form of inspection used to determine non-conforming products. [See *Inspection* or *Informative Inspection*]

JUST-IN-TIME (JIT): A system to make what the customer needs when the customer needs it in the quantity the customer needs, using minimal resources of manpower, material, and machinery – No More, No Less. The three elements to making Just-in-Time possible are Takt Time, Flow production, and the Pull system, as well as Standard Work. The opposite of Just-In-Time is "Just-In-Case" -- avoid this temptation.

JIT requires waste elimination, process simplification, set-up and batch-size reduction, parallel (rather than sequential) processing, and layout redesign. Just-In-Time approaches Just-On-Time when upstream activities occur minutes or seconds before down-stream activities, so that single-piece flow is possible. Just-In-Time is one of the two main pillars of TPS.

KAI-AKU: The opposite of kaizen. Change for the worse. Bad change.

KAIKAKU: Radical improvements or reform that affect the future value stream. Often these are changes in business practices of business systems. Usually applied only once within a Value Stream.

KAIZEN: The Japanese word for 'change for the 'better' or 'improvement'. Kaizen is an improvement, continual improvement in personal life, home life, social life, and working life. In the workplace, Kaizen means continuing improvement involving everyone regardless of position. It is a business philosophy of continuous cost reduction, reduced quality problems, and delivery time reduction through rapid, team-based improvement activity. Continuous improvement through incremental improvements. Kaizen implies more than improvement in basic processes. Kaizen represents a philosophy within which an organization, and the individuals within it, undertake continual improvements of all aspects of organizational life. The key to successful Kaizen is going to the worksite, working with the actual product/process, and getting the facts.

Kaizen is a system of incremental continuous improvement in which instances of waste (Muda) are eliminated one-by-one at minimal cost. This is performed by all employees rather than by just specialists. [Same as *Process Kaizen*]

KANBAN: A Japanese word for 'sign', Kanbans are typically a card or other visual method of triggering the pull system based on actual usage of material. It is a central element of a Just in Time system. Kanbans are attached to the actual work/item/product, at the point of use. Kanbans are cards that have information about the parts (name, part number, quantity, source, destination, etc.) but carts, boxes, and electronic signals are also used. Squares painted on the floor to indicate storage or incoming areas are frequently, but mistakenly, referred to as kanbans.

LAST IN FIRST OUT (LIFO): The result of a typical material or information flow system without FIFO, resulting in earlier orders being perpetually delayed by new orders arriving on top of them.

LEAD-TIME: The total time a customer must wait to receive a product or service after placing the request. When a scheduling and production system is running at or below capacity, Lead Time and Throughput Time are the same. When demand exceeds the capacity of a system, there is additional waiting time and Lead Time exceeds Throughput Time.

LEAN: *Lean* is simply a thought process or approach, not a tool, used to look at your business whether it is service, manufacturing, or any other activity where you have a supplier and a customer/receiver. The key thought processes within Lean are identifying 'waste' from the customer perspective and then determining how to eliminate it. Waste is defined as the activity or activities that a customer would not want to “pay” for and/or that add no value to the product or service from the customer's perspective. Once waste has been identified in the Current State, a plan is formulated to reach the Future State in an effective manner that encompasses the entire system. The term "lean" was coined by James P. Womack and Daniel T. Jones in their 1996 classic *Lean Thinking*, based on the Toyota Production System (TPS).

LEAN MANUFACTURING: A business practice characterized by the endless pursuit of waste elimination. A manufacturer that is lean uses the minimum amount of manpower, materials, money, machines, space etc. to get the job done on time.

LEAN ENTERPRISE: A Lean Enterprise is an organization that is engaged in the endless pursuit of waste elimination. A Lean Enterprise has a culture that does not tolerate waste of any kind.

LEAN TRANSFORMATION: Developing a culture that is intolerant to waste in all of its forms. A successful Lean Transformation should result in a Lean Enterprise, an organization that is engaged in the endless pursuit of waste elimination
.

LEVELING: Smoothing out the production schedule by averaging out both the volume and mix of products. Production leveling allows a consistent workflow, reducing the fluctuation of customer demand with the eventual goal of being able to produce any product any day. Leveling is the foundation of a Gemba Production System.

LOAD-LOAD: A method of conducting single-piece flow, where the operator proceeds form machine to machine, taking the part form one machine and loading it into the next. [Same as Chaku-Chaku]

MACHINE AUTOMATIC TIME: The time it takes for a machine to produce one unit, not including the manual time to load and unload.

MACHINE CYCLE TIME: The time it takes for a machine to produce one unit, including the manual time it takes to load and unload.

MACHINE WORK: Work that is done by a machine. The time it takes to do machine work can overlap with manual work, if the machine is manually operated.

MANAGEMENT BY OBJECTIVES (MBO): The precursor to Hoshin planning. MBO was introduced by Peter Drucker in his 1954 book, *The Practice of Management*.

MANUAL WORK: Work that is done by people, without the aid of machinery. The human tasks of operating or loading machines can also be called manual work.

MUDA: The Japanese word for 'waste.' Any activity that adds cost without adding value to the product. Any human activity which absorbs resources, but creates no real value for the customer. [See *Non-Value-Added*, *Waste*]

MURA: Variations and variability in work method or the output of a process; unevenness in operations.

MURI: Overworking, overburdening of people and equipment; unreasonableness; exertion;.

MULTI-MACHINE HANDLING: When a machine operator is running more than one machine of a certain type, this is called multi-machine handling.

MULTI-PROCESS HANDLING: When a machine operator is doing tasks for multiple processes sequentially, and this is contributing to the flow of material, it is called multi-process handling.

NAGARA: Accomplishing more than one task in one motion or function. A system where seemingly unrelated tasks can be produced by the same worker simultaneously. Japanese for 'while doing something'.

NAGARA SYSTEM: A production system where seemingly unrelated tasks can be produced by the same operator simultaneously.

NEMAWASHI: To prepare a tree for transplanting – this term refers to the formal and informal method of gaining consensus prior to the implementation of a Hoshin or plan. Preliminary work to involve other sections/departments in discussions to seek input, information, and/or support for a proposal or change (policy, etc.) that would affect them.

NON-VALUE-ADDED WORK: Activities or actions that may or may not be necessary but do not add real value as defined by the customer, making such activities or action a form of waste.. Examples are packaging, paperwork, travel, and inspection. Non-value-added tasks can create value if their function is to identify and eliminate waste.

OEE: Short for Overall Equipment Effectiveness, OEE is calculated based on Availability x Performance x Quality to determine how much of the time a piece of equipment is being used while it is actually making good parts at an appropriate speed. OEE is one of the 5 pillars of TPM.

ONE-PIECE FLOW: Moving the work/product through each step/operation as a single part, never handled in batches. One-piece flow processing is when the work/item/product is made one at a time and passed on to the next process. Among the benefits of one-piece flow are 1) the quick detection of defects to prevent a large batch of defects, 2) short lead-times of processing, 3) reduced material and inventory costs, and 4) design of workstations and equipment of the right size and design. It forces near-perfect balance and coordination.

OPERATOR CYCLE TIME: The time it takes for a worker or machine operator to complete a sequence of operations, including loading and unloading, but not including waiting time.

OPEN ROOM EFFECT: This common practice in Japanese offices involves taking down the walls and cubicles of an office and laying all of the desks out into one big 'open room'. This saves space and improves communication between those performing related tasks and creates a sense of teamwork.

OPERATING EXPENSES: The money required for the system to convert inventory into throughput.

OPERATIONS: Work or steps taken to transform material from raw materials to finished product. [See *Process*]

OVERALL EQUIPMENT EFFECTIVENESS: [See *OEE]*

PACEMAKER: Any process point along a value stream that sets the pace for the entire stream -- a device or technique use to set the pace of production and maintain *Takt* time.

PARADIGM SHIFT: Changing one's concept of what was believed to be correct. For example:

- One of the major functions of management is to make decisions about how work should be done (belief: workers are not capable of this). – TO – The People who do, are closest, to the work know it the best and how it can be done better.
- It is valuable and important to conduct reviews and inspections to assure the quality of work being done/produced. –TO-- Reviews and inspections in themselves are really a waste of people and time because the work should be done right the first time and that should be the focus.

PARETO CHART: A problem solving tool in the form of a vertical bar graph showing the bars in descending order of significance from left to right. A Pareto Chart focuses improvement activity on the "vital few" and not the trivial many. The 80/20 Rule comes from the Pareto Principle, stating that 20% of the items account for 80% of the activity (problems, sales, defects, etc.)

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PDCA: PDCA stands for 'Plan-Do-Check-Act' (see below). This is a basic principle for effective problem-solving during kaizen.

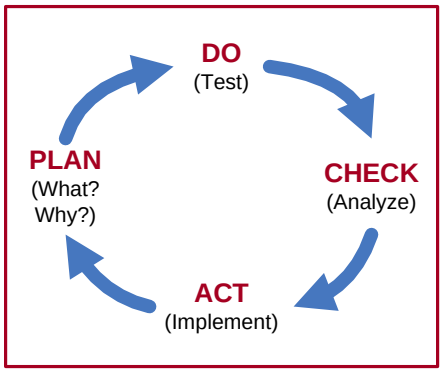
PERFORMANCE MANAGEMENT: Using a set of tools and approaches to measure, improve, monitor and sustain the key indicators of a business.

PHYSICAL TRANSFORMATION TASK: The task of taking a specific product from raw materials to a finished product in the hands of the customer. [See *Value Stream*]

PITCH: The pace and flow of a product.

PLAN, DO, CHECK, ACT (PDCA): The Plan, Do, Check, Act cycle developed by Walter Shewhart in the 1930's and refined by W. Edwards Deming. It is, simply, defining the problem/waste and generating solutions/changes, implementing the solutions/changes, evaluating the solutions/changes, and acting on what you've learned – as a result, the cycle starts all over again.

PLAN, DO, CHECK, ACT	
Plan	The visioning process in the context of the Business Plan/Action Plan, meaningful to all levels of the process/organization
Do	Answer the what's, how's, and who's for your process/organization
Check	On a periodic basis, review the measurements and note what you've learned that can help in the future
Act	Make the necessary adjustments to processes, plans, and priorities in order to ensure the success of the strategy breakthroughs



POINT OF USE STORAGE (POUS): Keeping all items needed for the job at the location of use in a neat and organized manner. POUS is one of the goals of *5S* activity.

POKA-YOKE: Japanese for 'mistake-proofing'. Mistake-proofing and fool-proofing devices made by designing parts, processes, or procedures so that mistakes physically or procedurally cannot happen. Poka-yoke workers are not blamed for the errors, but instead find ways to keep errors from becoming defects. A service request-taking example is a screening for request input developed from traditional request patterns that question requests falling outside the pattern. The "outlying" requests are then examined, often leading to the discovery of inputting errors or action based on misinformation. A *poka-yoke* is sometimes called a *baka-yoke*. [Also called Error-Proofing, Mistake-Proofing or Zero Quality Control (ZQC)].

These are low-cost, highly reliable devices, used in the jidoka system, that will stop processes in order to prevent the production of defective parts.

POLICY DEPLOYMENT: The selection of goals, projects to achieve the goals, designation of people, and resources for project completion, and establishment of project metrics. [See *HOSHIN KANRI]*

POLICY MANAGEMENT: A powerful strategic planning system developed in Japan in the 1960's. The "nervous system" of Lean Production. [Also known as *Policy Deployment* and *Hoshin Planning*]

PROBLEM: Problems in a process are the discrepancies between actual and desired performance. For example, a client has to wait too long for a service to be provided, work has to be done over again, work is reviewed multiple times at various stages of the process, services do not match or meet the needs of the client/customer, etc. Problems are solved by making changes that close these discrepancies. (See *Muda/Waste*)

PROCESS: The flow of material in time and space. The accumulation of sub-processes or operations that transform material from raw material/input to finished products. Processes are the series of action steps taken to convert inputs into outcomes. All processes have inputs, steps, and outcomes. Measurements can be made, data collected, and changes made and tested for improvements to these.

Organizations exist to serve customers. Customers are served by processes. The overwhelming majority of problems that organizations experience in serving clients are caused by their processes. Therefore, if the organization is to improve its client service, it must solve the problems in its processes.

PROCESS CAPACITY TABLE: A chart primarily used in machining processes that compares set-up and machine load times to available capacity. [Also *Table of Production Capacity by Process*].

PROCESS KAIZEN: Continuous improvement through incremental improvements. [Same as *Kaizen*]

PRODUCT QUANTITY PROCESS ROUTING ANALYSIS (PQPR): The PQ (Product Quantity) refers to Pareto analysis to determine the 80/20 rule of the top products or services that make up 80% of work volume. The PR (Process Routing) refers to the Parts-Process Matrix analysis to determine product families by grouping of products with similar process flows. The result of a correct PQPR results in a definition of value streams and sufficient process flow data to begin designing one-piece flow cells.

PRODUCTION PREPARATION PROCESS (3P): Rapidly designing production processes and equipment to ensure capability, built-in quality, productivity, and Takt-Flow-Pull. The Production Preparation Process minimizes resources needed such as capital, tooling, space, inventory, and time.

PRODUCTION SMOOTHING: Keeping total manufacturing volume as constant as possible. [Same as *Heijunka*. See *Leveling*]

PRODUCTION PREPARATION PROCESS: [See *3P*]

PULL SYSTEM: To produce or process an item only when the customer needs it and has requested it: Use One; Make One. The customer can be internal or external. An essential part of any *Build-To-Order* strategy. Having set up the framework for *Flow*, the next step is to only produce what the customer needs. *Pull* means that no one upstream should produce goods or services until the customer downstream asks for it. Contrast this concept to *Push*.

One of the 3 Elements of *Just-In-Time*. The pull system enables the production of what is needed, based on a signal of what has just been "sold." The downstream process takes the

product they need and 'pulls' it from the producer. This 'customer pull' is a signal to the producer that the product is sold. The pull system links accurate information with the process to minimizes overproduction.

PUSH SYSTEM: To produce or process an item without any real demand from the customer – usually creates inventory and all other 'wastes'. In contrast to the *Pull* system, the service/product is pushed into a process, regardless of whether it is needed right now. The pushed product goes into inventory, and lacking a pull signal from the customer indicating that it has been used/bought,, more of the same service/product could be overproduced and put in inventory. In a *Push* System, creating/producing more of an item or service is based on the anticipation of its use. A Push system attempts to predict when the item/service/material will be needed and will launch its processing in anticipation of this need.

Q SEVEN AND THE NEW SEVEN: The seven statistical tools, and the seven additional tools that have been the cornerstone of problem solving in the field of quality. [See *7 TOOLS* above]

QUALITY: Meeting expectation and requirements, stated and un-stated, of the customer.
QCD (Quality, Cost, and Delivery): Also the 3 Elements of Demand: Quality, Cost, and Delivery are the key customer satisfaction metrics that determine if a company is competitive. Kaizen activity focuses on improving QCD metrics.

QCDSM (Quality, Cost, Delivery - Safety & Morale): A set of performance management measures that includes employee satisfaction (safety & morale) as well as customer satisfaction. Lean Transformation aims to eliminate waste, improve QCDSM metrics, and increase profitability.

QUALITY FUNCTION DEPLOYMENT (QFD): A methodology involving a cross-functional team to reach consensus that the final product specifications are based on the wishes/voice of the customer. It is a visual decision-making procedure for multi-skilled project teams which develops a common understanding of the voice of the customer and a consensus on the final specifications of the service or product that has the commitment of the entire team. It integrates the perspectives of team members from different disciplines, ensures that their efforts are focused on resolving key trade-offs in a consistent manner against measurable performance targets for the product, and deploys these decisions through successive levels of detail. The use of QFD eliminates expensive backflows and rework as projects near launch.

QUEUE TIME: The time an item/work/product spends in a line awaiting the next design, request-processing, or processing step

QUICK CHANGEOVER: The ability to change tooling and fixtures rapidly (usually minutes), so multiple products can be run on the same machine.

REAL VALUE: Attributes and features of a product or service that, in the eyes of customers, are worth paying for. [See *Value-Added*, *Non-Value-Added*]

REENGINEERING: The engine that drives Time-Based Competition. To gain speed, organizations must apply the principles of reengineering to rethink and redesign every process and move it closer to the customer.

RESOURCE ACTIVATION: Using a resource regardless of whether Throughput is increased. [See *Resource Utilization*]

RESOURCE UTILIZATION: Using a resource in a way that increases Throughput. [See *Resource Activation*]

RIGHT-SIZE: Matching human, financial, and equipment/supply resources to the (Lean) process requirements.

ROOT CAUSE: The most basic underlying reason for an event or condition. The root cause is where action must be taken to prevent recurrence.

SENSI: The Japanese word for teacher -- an outside master or teacher that assists in implementing Lean practices. In acquiring Lean Knowledge, the Sensi often is directly involved with the student.

SEQUENTIAL CHANGEOVER: Also sequential set-up. In a flow process, when changeover times are within Takt Time, changeovers can be performed one after another. Sequential changeover assures that the lost time for each process in the line is minimized to one 'Takt' beat. A set-up team or expert follows the operator, so that by the time the operator has made one round of the flow line (at Takt time), it has been completely changed over to the next product.

SEQUENTIAL SET-UP: [See *sequential changeover]*

SET-UP REDUCTION: Reducing the amount of time a machine or a step/process is down during changeover from the last good piece to the first good piece of the next product.

SEVEN WASTES: Taiichi Ohno's original enumeration of the wastes commonly found in physical production. These are *overproduction* ahead of demand, *waiting* for the next processing top, unnecessary *transport* of materials (for example, between functional areas of facilities), *over-processing* of parts due to poor tool and product design, *inventories* more than the absolute minimum, unnecessary *movement* by employees during the course of their work (looking for parts, tools, prints, help, etc.), and production of *defective parts*.

SHUSA: The leader of the team whose job is to design and engineer a new product and put it into production.

SIX SIGMA: A methodology and set of tools used to improve quality to less than 3.4 defects per million or better. Six Sigma is a statistical term that equates to 3.4 defects per one million opportunities. Typical organizations/manufacturers operate at around three sigma, or 67,000 defects per million. Six Sigma can achieve dramatic improvement in business performance through a precise understanding of customer requirements and the elimination of defects from existing processes, products and services. Key tenets of Six Sigma: Define, Measure, Analyze, Improve, Control. To fully embrace Six Sigma, an organization must work intimately with all internal disciplines in addition to external suppliers and customers.

SMED: (Single Minute Exchange of Dies.) A system of a series of techniques pioneered and developed by Shigeo Shingo for set-up reduction and quick changeovers. The long-term objective is always Zero Setup, in which changeovers are instantaneous and do not interfere in any way with continuous flow.

STANDARDS: These involve comparison with accepted norms, such as are set by regulatory bodies. Examples include the standards for road/highway development and repair, for program and individual licensure, for conducting health & environmental tests, etc.

STANDARD WORK: Specifying tasks to the best way to get the job done in the amount of time available while ensuring the job is done right the first time, every time. Standard Work is the most efficient, optimum combination of man, machine, and material. The three elements of standard work are 1) Takt Time, 2) Work Sequence, and 3) Stand Work-in-Process. Performing standard work allows for a clear and visible 'standard' operation. Deviation from standard work indicates an abnormality, which is then an opportunity for improvement.

Standardized work is organized around human motion and creates an efficient production sequence without any waste. It consists of three elements: Takt-Time, Working Sequence, and Standard In-Process Stock.

STANDARD IN-PROCESS STOCK: This is the minimum quantity of parts/items always on hand for processing on and between sub-processes. It allows the worker to do his/her job continuously in a set sequence of sub-processes, repeating the same operation over and over in the same order.

STANDARD WORK COMBINATION SHEET (SWCS): A document detailing the sequence of production steps assigned to a single worker performing Standard Work. This document outlines the best combination of worker and machine.

STANDARD WORK SHEET (SWS): A visual work instruction drawing for Standard Work. Shows the work sequence, takt time, standard working process, and layout of the cell or workstation.

STANDARD WORK IN PROCESS: Also Standard WIP, or SWIP. The minimum work-in-process needed to maintain standard work. Standard WIP parts are 1) parts completed and in the machine after auto cycle, 2) parts placed in equipment with cycle times exceeding Takt time, and 3) the parts currently being worked on or handled by the operators performing standard work.

STATISTICAL FLUCTUATIONS: Kinds of information that cannot be precisely predicted.

STOP-THE-LINE AUTHORITY: When workers are able stop the line to indicate a problem, this is stop-the-line authority. The production line or machine remains stopped until the supervisor, manager, engineer, maintenance personnel, support staff or president have identified the problem and taken corrective action.

STRATEGIC PLANNING: Developing short and long-term competitive strategies using tools such as SWOT Analysis to assess the current situation, develop missions and goals, and create an implementation plan.

SUB-OPTIMIZATION: A condition where gains made in one activity are offset by losses in another activity or activities, created by the same actions creating gains in the first activity.
Sub-Processes: A series of operations combined. Part of a process.

SUGGESTION SYSTEM: In a suggestion system workers are encouraged to identify wastes, safety, and environmental concerns and submit improvement ideas formally. Rewards are given for suggestions resulting in cost savings. These rewards are typically shared among the production line or by the kaizen team.

SUNK COST: Any expenditure that has already taken place and can not be undone. Decisions should not be made based on sunk costs.

SUPERMARKET: A supermarket is a tightly managed amount of inventory within the value stream to allow for a pull system. It is a tool of the pull system that helps signal demand for the product. In a supermarket, a fixed amount of raw material, work in process, or finished material is kept as a buffer to schedule variability or an incapable process. A supermarket is typically located at the end of a production line (or the entrance of a u-shaped flow line).

SUPPLY CHAIN EXECUTION (SCE): A business strategy to improve stakeholder and customer value by optimizing the flow of products, services, and related information from source to customer.

SUPPLY CHAIN MANAGEMENT (SCM): Supply Chain Management encompasses the processes of creating and fulfilling the demand for goods and services and involves a trading partner community engaged in a common goal of satisfying the end customer. It is business strategy to improve shareholder and customer value by optimizing the flow of products, services and related information from source to customer.

SUPPLY CHAIN PLANNING (SCP): A subset of Supply Chain Management, this is the process of coordinating assets to optimize the delivery of goods, services, and information from supplier to customer, balancing supply and demand. A Supply Chain Planning suite overlays a transactional system to provide planning, what-if scenario analysis capabilities, and real-time demand commitments.

TABLE OF PRODUCTION CAPACITY BY PROCESS: [See *Process Capacity Table]*

TAKT TIME: Takt time is the pace at which the customer is buying a particular product or service. Takt time is the total net daily available "operating" time divided by the total daily customer demand. Takt time is not how long it takes to perform a task. Takt time cannot be reduced or increased except by changes in production demand or available time to work. Used in Lean as the rhythm of the process, i.e., if the customer wants a service every hour, the program/office should feel the heartbeat of producing a service every hour. Takt is a German word for 'pace,' 'beat,' or 'rhythm'. Takt time is one of the 3 Elements of JIT.

TAKT TIME**:** Total available processing time (minus all planned activities such as breaks, check-ins, safety meetings, etc. not available) divided by the customer's requirement/demand.

For Example:

- (1) 8 Hour Shift = 480 Minutes minus (2) 10 Minute Breaks = 460 Minutes available time
- 1840 Claims/Day Customer Demand/Requirements
- ➤ TAKT Time = .25 minute or 15 seconds (*One claim would have to be processed – at every step -- every 15 seconds in order to meet the customer demand*.)

TARGET COSTING: A way of establishing a cost goal for a product or service in the design phase. Target costing follows this formula: Sales price - Target Profit = Target Cost.

TEBANARE: Japanese for 'hands-free'. The goal of tebanare is to use low cost automation on manual machines to allow people to do work that is more valuable that only a person can do.

THEORY OF CONSTRAINTS (TOC): A lean management philosophy that stresses removal of constraints to increase throughput while decreasing inventory and operating expenses.

THROUGHPUT TIME: The time required for an item/work to proceed from concept to launch, request to delivery, or "raw" materials into the hands of the customer. This includes both processing and queue time. Contrast with Processing Time and Lead Time.

TIME-BASED STRATEGY: Driving improvement activity through focus on time and its relation to quality, cost, delivery, safety, and morale. Reduction in lead-time, set-up time, cycle time as a means of becoming more competitive.

TOYOTA PRODUCTION SYSTEM (TPS): A methodology that resulted from over 50 years of Kaizen at Toyota, one of the most successful companies in the world. TPS is built on a foundation of Leveling, with the supporting pillars of Just-in-Time and Jidoka. [See also *Gemba Production System*]

TOTAL PRODUCTIVE MAINTENANCE (TPM): Total productive maintenance aims at maximizing equipment effectiveness and uptime throughout the entire life of the equipment. It is

an integrated set of activities aimed at maximizing equipment effectiveness by involving everyone in all departments at all levels, typically through small group activities. TPM usually entails implementing the 5 S System, measuring the six big losses, prioritizing problems, and applying problem-solving with the goal of achieving Zero breakdowns. It is a series of methods, originally pioneered by Nippondenso (a member of the Toyota group), to ensure that every piece of equipment in a process is always able to perform its required tasks so that processing/work is never interrupted.

TSURUBE SYSTEM: A way to keep product flow continuous even when there are interruptions such as outside processing or batch operations. The tsurube system is often used when the work/product leaves the flow line for processing through equipment that can not be placed into the cell (vendor operations, heat treat, plating, anodizing, etc.). Also called the "Well Wheel System" because of the similarity to how water is drawn out of a well using two buckets and a pulley wheel.

TWO-BIN SYSTEM: An example of both visual management and the pull system, whereby two bins or containers are used trigger reorder of parts or materials. Each bin contains enough parts to last during the delivery lead-time. When one bin is empty, it is time to reorder the two-bin quantity.

UPTIME: The time a person, program, printer, copier, etc. is available compared to the time each is expected to be available/run for the step/task. For example, the time a supervisor is available for signatures, the time a copier works and is available. Usually expressed as an percentage, uptime is the ratio of the availability time to the actual work/production time.

VALUE: A product or service's capability provided to a customer at the right time, at an appropriate cost/price, as defined in each case by the customer. What does and does not create value is to be specified from the customer's perspective and not from the perspective of individual organizations, functions, and departments.

VALUE-ADDED ANALYSIS: With this activity, a process improvement team strips the process down to its essential elements. The team isolates the activities that, in the eyes of the customer, actually add value to the service or product. The remaining non-value-adding activities ("waste") are targeted for improvement or extinction.

VALUE-ADDED WORK: Activities or work essential to ensure a product or service meets the needs of the customer -- work that the customer is willing to pay for. A transformation of the shape or function of the material/information in a way that the customer will pay for. Activities or actions taken that add real value to the product or service. [See *Non-Value-Added*]

VALUE STREAM: All activities, both value-added and non-value-added, required to bring a product or service from request/order to the hands of the customer, and a design from concept to launch to production to delivery. By locating the value-creating processes next to one another and by processing one unit of work at a time, work flows smoothly from one step to another and finally to the customer. This chain of value-creating processes is called a value stream. A value stream is simply all the things done to create value for the customer. It is a series of all actions required to fulfill a customer's request, both value-added and not.

VALUE STREAM MAPPING (VSM): A VSM is a Lean tool used to visualize the value stream of a process, department, or organization. Creating a picture of the complete material and information flow from customer request through order fulfillment for an operation. Value Stream Mapping can be done at an enterprise level (showing customer-supplier relationships as well as distributors), a door to door level showing the flow of material and information primarily within a factory, office, or hospital operation, and a process level map with a narrower scope and more detail. The 'Current State' is how the process works today and the 'Future State' map shows improvements towards a long-term 'ideal state'.

It is a hands-on, pencil-and-paper tool used: a) to follow a product or information (or both) activity path from beginning to end and draw a visual representation of every process (value and non-value) in the material and information flows; b) then to design a future state map which has waste removed and creates more flow; and c) to end up with a detailed implementation plan for the future state.

VERTICAL HANDLING: When tasks are assigned in such a way that the materials processes are being progressively worked towards completion, this is vertical handling. This in contrast to horizontal handling which only focuses on the output of a specific process

VISUAL CONTROLS: Displaying the status of an activity so every employee can see it and take appropriate action. It is the placement in plain view of all tools, parts, processing activities, and indicators of process system performance, so everyone involved can understand the status of the system at a glance. Various tools of visual management such as color-coding, charts, andons, schedule boards, labels and markings on the floor. Used synonymously with Transparency.

VISUAL MANAGEMENT: When the normal state and abnormal state can be clearly and visually defined, visual management is possible. In visual management, simple visual tools are used to identify the target state, and any deviance is met with corrective action

WASTE: Anything that uses resources, but does not add real value to the product or service. Anything that does not add value to the final product or service, in the eyes of the customer. An activity the customer wouldn't want to pay for if they knew it was happening. The 3 forms of waste are muda (non-value-added tasks), mura (inconsistency), and muri (excessive stress & strain). [See the muda *8 Wastes*]

WELL WHEEL SYSTEM: [See *Tsurube System*]

WATERSPIDER: The waterspider is a skilled and well-trained person who makes the rounds supplying parts, assisting with changeover, providing tools and materials, and any additional help needed to maintain Standard Work and keep the flow going. The waterspider has a routine and knows all processes thoroughly enough to step in if needed. At Toyota, performing the waterspider role is a prerequisite for supervision and management positions. Named after the whirligig beetle that swims about quickly in the water.

WORK IN PROCESS: Items (people, material, or information) between steps or processes or activities waiting to be processed.

WORK SEQUENCE: The defined steps and activities that need to be performed in order for the work to be completed. Working Sequence refers to the sequence of operations in a single process which leads a worker to produce quality goods/services efficiently and in a manner which reduces overburden and minimizes the threat of injury or illness.

YAMAZUME: A yamazumi board is a bar graph typically showing the balance of workloads as operator cycle times. The yamazumi can also be sued for load planning and scheduling. The word "yamazumi" literally means "to stack up".

YIELD: Produced product related to scheduled product.

YOKOTEN: Information sharing; sharing of common activities, countermeasures, and ideas. Across everywhere. (Activities and/or countermeasures that are communicated organization-wide and with other organization affiliates).